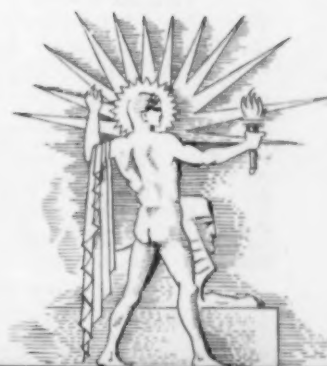
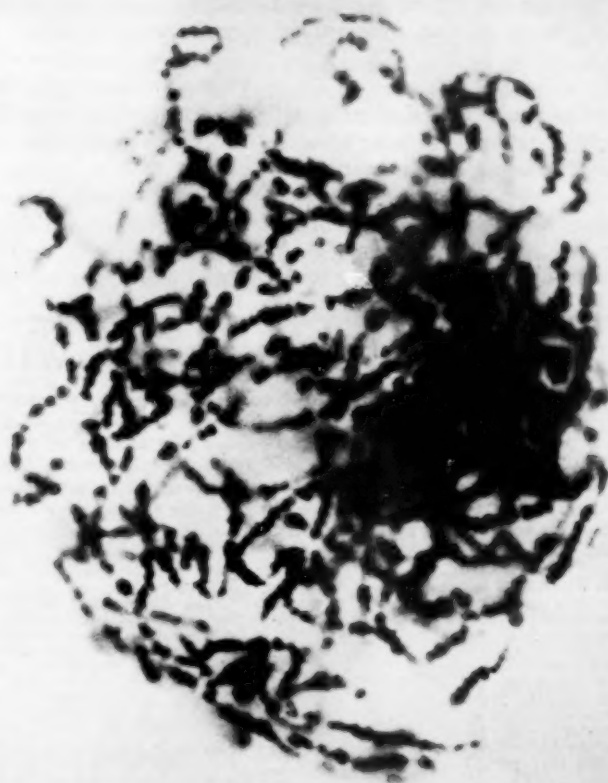


MAY 25 1932

SCIENCE NEWS LETTER

THE WEEKLY SUMMARY OF CURRENT SCIENCE •



MAY 21, 1932

The Chain of Heredity

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DO YOU KNOW THAT

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At one time, aluminum was priced at \$90 a pound.

Bananas contain all the known vitamins except D.

Lamb becomes more tender if kept in cold storage a week to ten days after slaughtering, according to "chewing" and mechanical tests.

Among the famous hailstorms of weather history was the storm of May 8, 1926, at Dallas, Texas, when some of the hailstones were as big as baseballs and the damage after twenty minutes was two million dollars.

The "tornado center" of the United States is almost at the geographical center.

A house made experimentally of sheet metal is reported to have unusual heat and sound insulating qualities.

Chinese soldiers roll cigarettes of tobacco mixed with the narcotic drug heroin, says a German physician.

Museum workers who were reconstructing one of the long-extinct saber-toothed tigers, devised false teeth of monel metal to make the animal look more real.

Persons walking on rural highways at night should carry lights, urges an insurance company, pointing out that 2,300 walkers were killed on highways last year.

Eleven different mountains, lakes and other natural features in the National Forests of the United States have been named after Forest Service officers who lost their lives in the World War.

The cotton-boll weevil has 66 bird enemies.

Potash was manufactured from the ash of sunflowers in Russia as far back as the sixteenth century.

A new gas-fired machine that dries wet cotton direct from the fields, is expected to prove useful to growers in rainy and foggy sections.

WITH THE SCIENCES THIS WEEK

CURIOSITY-AROUSING questions are prepared concerning the most interesting and important news in each issue. These questions should be a mental stimulant for the adult reader and a boon to the teacher who uses the Science News Letter to add zest to her classroom instruction.

Book reference in *italic type* is not the source of information of the article, but a reference for further reading on the subject of the article. Books cited can be supplied by Librarian, Science Service, at publisher's price, prepaid in U. S.

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ARCHAEOLOGY

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How fast is the new Reinmuth object moving across the sky? p. 330

ENGINEERING

What are the two systems used in home talking machines? p. 325. *The Talkies*—Arthur E. Krows—Holt, 1930, \$2.

What are three uses of iodine? p. 328

What vessels will be benefited by the proposed canal across northern Florida? p. 319

ENTOMOLOGY

How are the wings of the hawk-moth different from those of the Luna moth? p. 331

EVOLUTION

Where did Prof. William Patten find his long-sought-for "missing link"? p. 322. *The Ways of Life*—Richard Swann Lull—Harper, 1925, \$3.

GENETICS

How many genes were found in each cell of a lily? p. 329

GEOLOGY

Is the crust of the earth thicker or thinner under mountain ranges? p. 326

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How does thorium oxide make the liver visible on X-ray plates? p. 319

In what sort of an apparatus is the asthmatic patient placed to receive the new electrical fever treatment? p. 320

What germs have been found to cause chronic rheumatism? p. 321. *Conquering Arthritis*—H. M. Margolis—Macmillan, 1931, \$2.

What is the new test for determining a person's susceptibility to yellow fever? p. 328

Why should drug addicts be isolated? p. 325

ORNITHOLOGY

From what were Germany's swallows rescued? p. 321

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Of what value are aerial maps to archaeologists? p. 321

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What type of enemies levy the biggest tax on wheat? p. 331. *Outlines of Agricultural Economics*—Henry C. Taylor—Macmillan, Revised ed., 1931, \$3.25.

PHYSIOLOGY

How long a wait is there before the pupil of a normal eye accommodated to the dark will begin to contract from the effect of a light flashed upon it? p. 328

MEDICINE

X-Rays of Liver Possible Through Chemical Injection

New Technique, Causing Organ to Show up Clearly On Photographic Plate, Aids Physician in Diagnosis of Case

PIONEER work in the use of a new method of diagnosing serious, often fatal, diseases of the liver and spleen was reported to the American Medical Association meeting at New Orleans. The new method detected conditions which could not be determined by any other laboratory or clinical methods now in use. Dr. Wallace M. Yater, professor of medicine at Georgetown University School of Medicine, said in discussing the result of a study made by himself and his associate, Dr. Laurence S. Otell.

In using the new test, a small amount of a solution called thorium dioxide sol is injected into the veins every day for three days. On the fourth day X-ray pictures are taken of the liver and spleen. Ordinarily these important organs do not show up well on the X-ray plate, but after the thorium dioxide injections the shape of both spleen and liver may be clearly seen. In this way physicians will be able to tell whether these organs are enlarged, whether there is fluid in the abdomen, whether such diseases as cancer, cirrhosis or syphilis of the liver are present, and whether a large mass in the left side of the abdomen is an enlargement of the spleen or a tumor of some other organ.

Safe to Use

The substance which makes all this possible is a compound of thorium, a heavy metallic element related to radium. Thorium dioxide, however, has no radioactivity and is a perfectly safe compound to use. It was first investigated for this purpose by a German, Dr. Radt, of Berlin, in 1928. Two other foreign scientists have investigated it, but the Georgetown group is the first to try it in this country.

Being a foreign substance, the thorium dioxide is taken up by certain blood cells whose duty it is to fight infections and gather up foreign matter in the body. These cells are very highly concentrated in the liver and spleen. When they are full of heavy, opaque thorium dioxide, they and the whole organ show

up in the X-ray pictures, Dr. Yater explained.

Because these cells are also present in great numbers in bone marrow the new method may be used for diagnosing disease of this substance and of intracranial disease.

Most valuable of the older tests for determining how the liver is functioning is the icteric index, which indicates the presence of jaundice by showing the amount of bile pigment in the blood, Drs. William Egbert Robertson, William A. Swalm and Frank W. Konzelmann of Philadelphia stated at the same session.

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ENGINEERING

Huge Canal May Be Built Across Northern Florida

THE CONSTRUCTION of a great ship canal across northern Florida to save more than 800 miles, or three days sailing time on a round trip between North Atlantic and Gulf ports, is urged in a report made by Col. Gilbert A. Youngberg to the Florida Engineering

Society following a preliminary study.

He believes that the project is well worth a complete survey of the site by Army engineers. Col. Youngberg's study, made for the City of Jacksonville, was authorized by the 1930 River and Harbor Act. A special board of engineers is now making a study of the most practicable route.

The canal would be one of the world's largest engineering projects. It is roughly estimated that it would cost between \$125,000,000 and \$200,000,000. Vessels plying between Gulf ports and northern Europe would be benefited almost as much as those going to or from the Gulf and North Atlantic American ports.

Immense Savings Possible

During 1929, Col. Youngberg said, 1,487 vessels made 10,341 voyages that would have profited by the canal. These ships are the larger portion of those sailing from the Gulf, it was pointed out, since only 1,971 vessels traded between ports on the Gulf and ports elsewhere.

The immensity of possible savings in tonnage the new canal will effect was emphasized by comparison with freight now carried by well-known inland waterways. The ton-mileage savings of the projected canal will exceed 20,000,000,000 statute ton-miles, it was stated.

"This is more than ten times the ton-mileage carried on that portion of the Mississippi River between St. Louis and New Orleans," Col. Youngberg said. "It is more than 13 times that on the Ohio between its mouth and Pittsburgh, and it is about eight times the ton-mile-



ETERNAL SNOW IN CALIFORNIA?

Looks like it, but the white banks are gleaming masses of pumice stone—the so-called Pumice Stone Mountain in northern California, east of Mount Shasta and southwest of the Modoc Lava Beds. Photograph by R. H. Finch.

age on the Monongahela, that paragon of inland waterway freight lines."

The canal would be of great benefit to the American merchant marine, it was pointed out, because, out of a total of more than 10,000 voyages which would have been benefited by the canal in 1929, 7,610 were made by American vessels and only 2,731 by vessels of foreign register.

Science News Letter, May 21, 1932

SOCIAL SCIENCE

Depression May Mark America's Coming of Age

"BLACK THURSDAY" in October, 1929, now observed as an anniversary of a much-lamented stock market crash, may be revealed in the future as the date of America's coming of age in both an economic and an intellectual sense, Morse A. Cartwright, director of the American Association for Adult Education, has declared.

"The sudden diversion of public thought in the United States," he said, "from the all-absorbing pursuit of the dollar for the dollar's sake to the opposite extreme of the painful economic consequences of a prosperity debauch, has resulted in an increased public attention focused upon the complex problems of living. To this extent the uses of adversity have proved sweet: Americans are examining principles—economic, psychological, historical and philosophical—with a skepticism seldom exhibited during the boom days. They are also showing a disinclination to accept business, governmental, or other leadership at face value which is at once the despair and the hope of the democracy."

Science News Letter, May 21, 1932

MEDICINE

Electrically Produced Fever Relieves Asthma Sufferers

ARTIFICIAL fever produced by electrical heating gave relief to 42 sufferers from intractable asthma, Drs. Samuel M. Feinberg, Stafford L. Osborne and Meyer J. Steinberg of Chicago reported to the American Medical Association. Nineteen of the 42 patients were free of asthmatic attacks for considerable time after treatment.

The Chicago physicians based their treatment on the observation that the

PALEONTOLOGY-ARCHAEOLOGY

Finding of Arrow Head Near Mammoth Bone Raises Query

THE REPORTS of the finding of an arrow point in close association with the jawbone of a mammoth at Flagler Beach, Fla., write into the scientific record another chapter of the investigations to determine whether human beings lived in America contemporaneously with animals that have heretofore been considered extinct before man arrived on this continent.

The discovery was made by the Explorers' Club of Rollins College, Winter Park, Fla., a student group, with Jack H. Connery of the museum staff as leader. Excavating in a sandy muck deposit about a mile inland, the students proved the site rich in ancient animal remains. Skeletal parts of mastodons, turtles and probably camels were unearthed in addition to mammoth bones.

The discovery that particularly focussed attention of scientists on the work was made by Mr. Connery. What proved later to be the jawbone of a mammoth was encountered a few feet below the surface and as Mr. Connery explained to Science Service:

"On trying to determine identity of the object, it was necessary to follow the outline with the bare hand. On reaching under it, a cavity was discovered large enough to insert my hand. From this cavity I extracted a handful of wet loose substance which differed

from surrounding soil and which contained a hard object. The material was washed from the hard object, which made chemical analysis impossible. The object proved to be an arrow head, which J. E. Spurr, visiting professor of geology at Rollins College, determined as chert."

The circumstances of this discovery raised the question as to whether some prehistoric man might have shot the prehistoric elephant. Mr. Connery communicated word of the discovery to Dr. Carl E. Guthe, chairman of the State Archaeological Surveys Committee of the National Research Council, who in turn asked Science Service to look into the matter as a part of its archaeological and anthropological reporting plan operated in collaboration with a National Research Council committee.

Gene M. Stirling, archaeologist of the Peabody Museum, and Walter W. Holmes, paleontologist of St. Petersburg, Fla., acted as Science Service "minute men" and studied the circumstances of the discovery with Mr. Connery. They reported that the discovery was inconclusive as to whether the arrow point was actually shot into the mammoth skull. They expressed the opinion that a valuable site of promise had been explored and urged that scientists in the fields concerned cooperate in further excavations.

Dr. C. W. Stiles, the eminent zoologist who is visiting professor of zoology at Rollins College, visited the site and expressed the following opinion:

"The one point upon which I am willing to commit myself at present is that the teeth belong to the genus *Elephas*, *sensu lato*, in the broad sense of the term. The finding of an arrowhead and of a needle-like object in connection with these remains is exceedingly suggestive."

The Flagler Beach discovery promises to take its place alongside more than a hundred reports of the association of man with extinct animals in various parts of America. These discoveries, variously interpreted, provide fuel for the continuing discussion as to the antiquity of man on this continent.

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NO AIRPLANE RISKS

Mosaic map of the ruins of Armageddon, pieced together from balloon photographs of parts of the area. The rectangular enclosure in the upper right-hand corner is the site of Solomon's stables. Right, meteorological balloon, equipped with camera for short-range aerial photographs, in front of its hangar near Megiddo, the Biblical Armageddon.

MEDICINE

Vaccines Used Against Germs Which Produce Rheumatism

GERMS as the cause of chronic rheumatism and vaccines to treat it were discussed by Dr. Reginald Burbank of New York City at the meeting of the American Medical Association in New Orleans.

In some early investigations into the cause of this widespread and distressing disease which doctors call arthritis, Dr. Burbank and his associates found that the blood of these patients carried protective substances against several strains of streptococcus germs. Since these could only have been formed under the influence of the germ, the investigators decided that the germs must be present in the blood. By a special technic they obtained some of the streptococci, but found them to be not the usual virulent type but another less active one that had developed the ability to live without arousing active resistance in the patient's body.

Rabbits after getting injections of cultures of these organisms developed the same chronic disease of the joints that had afflicted the human patients. Various tests showed that the changes

in the tissues of the rabbits, identical with those in rheumatic patients, were caused by the actual presence of germs carried to the joint by the blood from a focus of infection such as the teeth or tonsils.

The most effective means of treatment is a vaccine, Dr. Burbank said. Removing the teeth or tonsils, which are the most common foci of infection, may or may not be helpful in chronic rheumatism. If the germ causing the disease is already in the joint, as his investigations tend to show, removing the original source cannot give complete relief, Dr. Burbank pointed out.

In addition to the vaccine he recommended increasing the general resistance by diet, tonics and general constructive measures. He mentioned especially the beneficial effects of good posture, which improves circulation, decreases mechanical strain and increases general well-being. The intestinal tract is the most important secondary focus of infection, he said, so it is especially important to keep it in order.

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PHOTOGRAPHY-AERONAUTICS

Unmanned Balloon Used To Make Aerial Maps

PHOTOGRAPHS of ruined and ancient cities are now taken from the air without the expense of running an airplane and the risk that goes with low flying. The apparatus used, moreover, "stays put" and gets the pictures from exactly the spot desired, and at an accurately controlled altitude.

The technique for the new low-altitude airplane photomapping has been worked out by archaeologists of the Oriental Institute of the University of Chicago. They hitch their camera to a small, unmanned balloon, such as is commonly used in Weather Bureau work, reel it out to the desired height, and release the camera shutter with an automatic device. By pointing the camera at different parts of an area they take partial photographs, which are then pieced together into a mosaic map.

In their recent work at the mound of Megiddo, the Armageddon of Bible fame, such a mosaic map shows accurately the skull-shaped outline of the town, with details of all streets and buildings, including the famous Stables of Solomon. Such maps are invaluable to archaeologists, for they frequently show traces of buried structures that cannot be seen from the ground.

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ORNITHOLOGY

Rescued Swallows Return To Home in Germany

GERMANY'S rescued swallows have come home.

Last fall the birds were trapped by the too-sudden advent of winter, before they had made the crucial flight over the Alps into Italy. Bewildered, threatened with exhaustion and starvation, they lingered in southern Bavaria, unable to wing their way over the mountains because of the incessant storms that raged there.

Fearing for a serious depletion of the species, bird lovers in Germany and Austria captured thousands of them as they huddled, wet and wretched, on their perches. They slipped identifying bands about their legs, and then shipped them in cages into Italy.

Lately the first wave of northward-migrating swallows passed over Bavaria. Some of them were trapped, examined and released. They wore the identifying bands.

Science News Letter, May 21, 1932

EVOLUTION

Found: Most Important Missing Link

Fossilized Ostracoderms Furnish Proof for Theory That Vertebrates and Invertebrates Had a Common Ancestor

By FRANK THONE

DIFFERENT persons attach quite different meanings to the words "missing link." To many it means but one thing: the hypothetical hairy creature midway between man and monkey—a figure of the Devil to the literalist theologian, and almost the image of a god to the equally naive "free-thinker." He is the more fascinating to the mind, and the more protean in his outline as imagined by artists, because he hasn't been found yet, and so we can make him look like anything we've a mind to.

But the more serious scientist is always mildly bothered when he hears people talk of "the missing link," as though there were but one of him. He knows that there are many missing links in the evolutionary chain, many gaps between groups of animals probably related by descent, which must be closed before that descent can be considered reasonably well demonstrated.

The gap between ape and man, even between the highest ape and the most beetle-browed of the old cave-men, is not the widest one that exists in the evolutionary Chinese puzzle, either. Most scientists, in fact, have quit concerning themselves greatly about it, and now consider the physical kinship between man and the rest of the primates, if not definitely proven, at least something to be taken for granted. They extend the family tree away back of that, indeed, and include all backboneed animals, clear down to the poorest fish that swims, in one great cousinship. St. Francis, calling the wolf his brother and the birds his sisters, was no more gravely serious than a modern zoologist, and not half so literal-minded.

But when it comes to the invertebrates, to giddy Brother Grasshopper and to Sister Spider, that industrious spinster, to Cousin Crab and Uncle Oyster, and poor old Grandfather Worm, we cannot assert our relationship with nearly so much confidence. We can slap a brother Elk on the back, be he two-legged or quadruped, and we find a fraternal backbone there; but these

creatures that have no vertebral column continue to be somewhat alien and aloof; and it does leave us a trifle uncomfortable. Here is the place where the big gap stands; here is where a missing link is most missed. Who shall tell us which of these rather queer fourth-cousins-thrice-removed is our nearest kin, and which one of them shares great-great-ersogreat grandfathers with us?

Forty years ago, just at the sunset of Charles Darwin's life, a young Dartmouth College professor, William Patten, thought he had seen one of those resemblances by which cousinships can be traced. It began with eyes, as it often does in identifying cousins.

That Third Eye

Only it wasn't the two eyes that we all know we have. It was the hidden third eye inside of our heads, buried in the front of our brains, which we and all the higher vertebrates use as a gland nowadays. Only in a few of the lower vertebrates does this third eye, the pineal eye, located on the mid-line of the head, come near to the surface; and even in these it is inconspicuous and sightless. But though we don't use this third eye as an eye any more, it is an almost unique organ, and only one of the several lines of invertebrate animals have it. These are the arachnids: the spiders, scorpions, horseshoe crabs, etc.

But arachnids have more than this curious and unique third eye in common with vertebrates, underlying their wide surface dissimilarities. Prof. Patten came out boldly with the suggestion: why not an arachnid as ancestor to the vertebrates? He backed up his theory with a long series of technical papers showing that the basic pattern of bodily organization and development in the arachnids and vertebrates is essentially the same and quite different from that of any other kind of animals.

That is, the arachnid theory is *not* based merely on outward appearance.

Of course it would have been nonsense to suggest a familiar spider or a tropical scorpion as ancestor of the backboneed animals. These creatures are themselves too highly evolved along

special lines ever to be the ancestors of anything but more spiders or scorpions. But back along the line somewhere might there not be an ancestor-arachnid not so specialized, capable of begetting separate progenies so diverse as modern arachnids and modern backboneed animals? Prof. Patten thought there was. He pointed to the sea-scorpions, or eurypterids, creatures that swarmed in the Silurian seas.

There's nothing especially unfamiliar about the outline of the sea-scorpions. They had the elongate, jointed bodies that we have always known in such things as lobsters and insects, and some of them had long spines sticking out behind their tails, suggestive of the stings of modern land scorpions, and their general plan of organization was like that of all vertebrates. There were giants in those days, too; plenty of sea-scorpions have been found that are more than six feet long. But they are all dead and gone now—were ages gone even before the first fishes appeared or the first dinosaur pipped his reptilian eggshell. Only their fossils are still quite abundant in certain old shaly rocks, to show that once they flourished and dominated sea society.

These primitive arachnids are the oldest and most highly organized animals preserved as fossils. They were the rulers of the sea long before any of the fish-like vertebrates made their appearance. They were the first animals highly enough organized to perceive (or sense) their prey at a considerable distance and could effectively chase and capture it. For that reason alone, says Prof. Patten, they are more logical and *respectable* predecessors than the many kinds of worms and such-like traditional ancestors—which so far as we know had none of these bodily qualifications for higher development.

Along with the sea-scorpions' remains, geologists find the fossils of creatures of another type, enough like them in general structure to be descendants of the same line. These are the ostracoderms, sometimes called "dawn fishes." A casual observer looking at a reconstructed ostracoderm would probably call it a fish, though a queerish kind of a fish. There is something undeniably fish-like about its general outline, especially abaft o' 'midships. The body has the fish-like tapering form,



PROF. WILLIAM PATTEN

—holding a slab bearing the fossil of an ostracoderm, which he believes the probable ancestor of all vertebrate animals.

ending in an upsweeping tail-fin very much like that of the sharks, which are sometimes regarded as the most primitive of fishes.

But the front end of an ostracoderm is highly unlike that of any modern fish. The head and forepart of the body were covered with a stiff armor of bony plates, that made some of them look more or less like a horseshoe crab. This armor gave the ostracoderm its name, which is Greek for "shell-skin." Despite their armor, however, it is highly improbable that the ostracoderms were at all belligerent: more likely they wore it because they were too proud to fight, or too lazy, or slow, or stupid. All evidences indicate that they were bottom-dwellers and mud-shovellers, like catfish.

Submarine Armored Tanks

Although their armored heads made them unlike modern fish, even that did not make them un-fishlike, by ancient geological standards of comparison. In the next geological age after the days of sea-scorpions and ostracoderms, the Devonian, when the world belonged to the fishes, there were swimmers in the sea that were veritable submarine armored tanks; and while it is by no means certain that they descended from the sea-scorpions, armor and all, yet the fact remains that there was a kind of family resemblance.

And above all else, in this catalog of connecting resemblances, stands the fact that these ostracoderms, like the sea-scorpions on one side and the fishes and

other vertebrates on the other, possessed that third, pineal eye.

Yet for all that, Prof. Patten's fellow-scientists did not assent to his doctrine of an arachnid ancestry of vertebrates, through the sea-scorpions and the ostracoderms. Some of them had favorites of their own, whose claims they were interested in pushing. And in any case, there was the difficulty of finding a resemblance in the rest of the face. It is all very well to find a similarity in eyes, even in third eyes; but how about the mouth?

There, for forty years, Prof. Patten was stumped. There is an undeniable difference between the vertebrate and the invertebrate mouth. Our mouths open on the under-side of our heads; the mouths of the invertebrates open in front, or on top. Although the fossils of the ostracoderms were for the most part very equivocal on this point (for the animals died pretty unanimously back up, and so their fossils show better detail of their dorsal than of their belly sides) what evidence there is has all been that the ostracoderm mouth opened in front, like all other invertebrate mouths.

For forty years Prof. Patten spent most of his spare time travelling to places where ostracoderm-digging was reported to be good, always seeking fossils that would show their mouths. To Canada, Newfoundland, Scotland, Spitsbergen, Russia, Australia, Java and Central America he went. He added vastly to the world's knowledge of these strange creatures and of the first fishes that swam the seas. But always the main point eluded him.

At last, just as he was looking forward to his retirement to the position of professor emeritus, he found what he was seeking. There is a rich deposit of Silurian fossils on the little Baltic island of Oesel, once a part of Russia, now held by the new republic of Esthonia. There, and there only, a small species of ostracoderm has been found that Prof. Patten believed would show what he wanted, if he could only find a good specimen. Twice before he had visited the island and dug, but found only imperfect fossils. Finally, Dartmouth College financed a third expedition, and gave him enough money so that he could hire laborers to help him.

And he found his specimens, and they showed their mouths!

They showed that the ostracoderm mouth was evolving toward the vertebrate pattern, with a series of bony arches closing over the opening. In

vertebrate animals also there are these same bony arches. They have become involved in other structures, some of them; the slender arch called the "hyoid" that holds the base of the tongue, two pairs of them infolded to become a part of the palate-and-nose complex. But various parts of these arches do go to make jaws, do help to form a mouth, to build a face.

True, the paired jaws of the little ostracoderm from Oesel work sidewise instead of up and down, and the mouth therefore lies lengthwise instead of crosswise. But that is relatively a minor matter. The important thing is that the skeletal arches have closed over.

Similar in Human Embryo

In the human embryo it is possible to see a very similar thing happening. At an early stage, the mouth is open, gaping, has no united jaws; there is, indeed, no face at all. Several pairs of arches start to grow in from the sides, gradually closing the gap. For a time there is a lengthwise opening as well as a crosswise one, and remnants of this sometimes persist in such physical misfortunes as cleft palate and harelip. Normally the cleft is quite closed, and the mouth comes to be the gap between two pairs of arches instead of between the abutting ends of several pairs.

But what difference does it make whether worms, insects or scorpions were the ancestors of man and the other backboneed animals?

It makes a very great difference, declares Prof. Patten. For countless problems of vertebrate anatomy and embryology are dependent for their solution on the particular kind of animals that were the remote ancestors of the vertebrates. Moreover, some of the most fundamental problems of the philosophy of organic evolution depend on the course or path that evolution has followed in the remote past and the relative value of the various factors, internal and external, that have brought it about.

For example, was it the initial pattern of bodily organization, established in the sea-scorpions something like a thousand million years ago, that largely or wholly determined the subsequent course of organic evolution? Or was it mainly the cosmic environments of suns and seas and lands? Or was it mainly the swarming social environments procreated by their germ-like type of bodily organization, one which has always held the leadership in the kingdom of animal life?

ENGINEERING

Noisy Audience Limits Sound-Proofing of Theater

THE CHATTER and commotion of a theater audience itself sets the limit to which modern engineering can sound-proof a building, it was pointed out in a paper presented before the Society of Motion Picture Engineers by S. K. Wolf and J. E. Tweeddale of Electrical Research Products, Inc.

"It is possible to treat other noise sources, but the audience is a source over whose output our control is meager," they stated.

From a series of observations in theaters Mr. Wolf and Mr. Tweeddale found that the noise level of an ordinarily quiet auditorium is from 25 to 30 decibels above audibility while street noise outside, at least that of average New York city traffic, creates a noise of from 60 to 70 decibels.

By properly insulating walls, doors and windows, the street noise that enters can easily be reduced to less than that caused by the audience. Ventilating systems, projection apparatus and other theater services can also be made less noisy than the people themselves, it was pointed out.

Science News Letter, May 21, 1932

ANIMAL PSYCHOLOGY

Fish Swim Tail First In Illusory Current

FISH ordinarily head upstream, as every angler knows, but when placed in an artificial environment which provides the illusion of running water they can be made to behave quite differently. This fact was learned by Ralph G. Clausen, of Union College at Schenectady, N. Y., who built a special little aquarium and experimented with natives of the lakes and streams of Saratoga county, New York.

On the bottom and sides of the glass aquarium Mr. Clausen placed a white-and-black striped cloth, movable either forward or backward. The fish used in the tests were selected from various fresh water habitats. All were young specimens.

The black-nosed dace, which is accustomed to a strong current, turned about quickly and headed in the direction of the moving cloth. The common shiner, taken from wide streams where the current is moderately swift, followed closely the slow movement of the cloth and could be made to swim tail first the en-

tire length of the aquarium. When the sides and bottom were speeded up, however, it took the opposite position and swam against the "current."

Regardless of the movement of the cloth, the darter fish looked on disinterestedly, refusing to move. The home of this fish is at the bottom of quiet pools. The common sucker behaved like the black-nosed dace, but moved less quickly. Mr. Clausen explained this by the fact that the sucker is used to a slower current than the dace.

The reactions of the killifish were generally slow and hesitant, while the sunfish moved only enough to get its head in the direction of the current.

Mr. Clausen accounts for the behavior of the fish as due mainly to the stimulation of the sense of sight. As lake fish were found to respond more slowly than stream fish, he concluded that there is a proportionate relationship between the speed of the fish's reaction to the optical stimulus and the speed of the water which the fish is used to in its natural home.

Science News Letter, May 21, 1932

ARCHAEOLOGY

Hidden Pyramid Found In "Castle" at Chichen Itza

A TUNNEL sunk into the side of El Castillo, chief of the temple-topped pyramids of the ancient Maya city, Chichen Itza, has revealed an older pyramid within. A large stone tiger was discovered near an old interior wall.

The habit the ancient Indians of Mexico had of enlarging an old substructure for a temple by heaping it over with earth and rock, has forced a new technique on Mexican archaeologists the past few years. In order to show the inner structures, and not disturb the outer covering, they make tunnels by which visitors can view the works of different epochs in the past.

The Castillo of Chichen Itza is a pyramid almost 100 feet high. A beautiful limestone temple to the feathered snake god Kukulcan stands on top. It is called the Castillo, or castle, because in the Spanish conquest of the Mayas, the white men used it as a fort.

The Mexican government has now restored the temple, and two of the panelled sides of the supporting pyramid. Through the other two sides, left in their ruined state, Mexican archaeologists have sunk the tunnels that reveal the inner structure of the pile.

Science News Letter, May 21, 1932

IN SCIENCE

MEDICINE

Vitamin A Found Helpful In Child Ear Infections

INDICATIONS that vitamin A is helpful in preventing and treating ear infections of children appeared in a study reported by Dr. Claude C. Cody of Houston, Texas, to the meeting of the American Medical Association.

Dr. Cody found that the addition of cod liver oil to the diet of many infants and children during the past few years has been accompanied by a decided decrease in the number of cases of acute abscesses of the middle ear. It cannot yet be definitely said that the cod liver oil has brought about this result, but the evidence is strong enough to warrant continuing its use, in Dr. Cody's opinion.

In treating the disease, a nutritious diet is second in importance only to draining the abscess, Dr. Cody said. He found in a large series of cases that adding large amounts of vitamin A to the diet reduced the period of discharge, made repeated incisions less frequent, complications of the mastoid bone less frequent and the return of hearing more prompt.

Science News Letter, May 21, 1932

PHYSIOLOGY

Liver Symptoms May Look Like Pituitary Disorder

WARNING against being misled by symptoms of pituitary gland disorder which might instead be caused by a "bum liver" was issued by Dr. Allen Winter Rowe of Boston at the meeting of the Association for the Study of Internal Secretions.

Dr. Rowe reported that in a surprisingly large number of cases of thyroid gland disease there is an accompanying liver disorder. While either of these conditions alone could be readily recognized, the two together are often mistaken for disease of the pituitary and treated with extract of that gland. Instead, the liver must be treated first, and then the thyroid gland, Dr. Rowe advised.

Science News Letter, May 21, 1932

CE FIELDS

PHYSIOLOGY

Excess of Hormone Held Cause of Ovarian Cyst

DISCOVERY of the cause of cysts of the female sex glands, a distressing condition frequently occurring in women past middle age, was reported by Drs. John Burch, J. Wolfe and R. S. Cunningham of Nashville, to the meeting of the Association for the Study of Internal Secretions. These investigators were able to produce in mice a condition resembling that found in human patients by a process which caused secretion of too much of one female sex hormone in proportion to another. This relative excess of the one hormone they consider the cause of the cysts.

Science News Letter, May 21, 1932

ENGINEERING

Home Talkie Sets Almost Ready for Open Market

SOUND motion pictures for the home, classroom and small audiences generally have been practically realized and can be expected on the open market soon.

This is indicated by the demonstration of three systems of "talkie" projection, using the small-sized 16-millimeter film that has become standard for home projection of silent motion pictures, before the meeting in Washington of the Society of Motion Picture Engineers.

One of the systems uses phonograph records synchronized with the film; the other two have the sound record incorporated in the film itself as light-and-dark bands, through which a pencil of light is passed to play upon a photoelectric cell and translate light fluctuations into sound waves. One of these two systems has revived the selenium cell, pioneer photoelectric device, but improved now to such a point that its performance seems to be superior to the larger and more elaborate cells of the potassium and caesium type.

All three types of narrow-film "talkie" can be made by copying from the larger films used in regular motion

picture houses; though there is a considerable difference in cost between them, due to their differences in method of transferring the sound record. The demonstrations showed, however, that the sound could be successfully transferred from the large films to the little ones: one of the exhibitors had samples ranging all the way from Mickey Mouse to a Martinelli solo.

A "five-in-one" home movie cabinet, indicating the type of machine that may eventually be expected on the market, was on display. It can be used as radio set, phonograph, projector for silent film, projector for film-with-phonograph-record, and projector for film-with-sound-track.

Science News Letter, May 21, 1932

MEDICINE

Isolation of Drug Addicts Recommended by Doctors

BEST RESULTS in the fight against drug addiction will come from considering it a plague or epidemic like yellow fever, and fighting it on medical and psychiatric grounds, it appeared from the discussion of narcotic drugs by Dr. Paul Wolf of Berlin, editor of a leading German medical journal, and Dr. Walter Treadway, of the mental hygiene division of the U. S. Public Health Service, at the American Medical Association. Drug addicts should be isolated much as if they had a contagious disease, because contact with other addicts is a leading factor in causing new cases of addiction. Such segregation and treatment as mentally and physically sick patients has been given legislative sanction in the United States by the establishment of the Federal narcotic farms for treatment of addicts who have committed offenses against the United States and for those who may seek voluntary treatment.

Production of satisfactory substitutes for habit-forming narcotic drugs was discussed as the eventual solution of the problem by both speakers. Work along this line is being conducted at the University of Virginia and the University of Michigan in this country. Restrictions which reduced by about one-half the amount of cocaine used annually in Germany were described by Dr. Wolf. He was not so hopeful about the chance for reduction of the amount of opiates. Observing that too much opium is being grown, he raised the question of what the poppy growers can grow instead to make a living.

Science News Letter, May 21, 1932

MEDICINE

Malaria Treatment Cures One-Fourth of Paralytics

A QUARTER of the sufferers from the general paralysis type of insanity when treated with malaria have been practically cured and restored to former occupations, the U. S. Public Health Service has announced in giving details of a new program of study of the treatment.

Over ten thousand cases have been reported in the medical literature since 1917 when Prof. von Jauregg of Vienna began to treat that advanced stage of syphilitic infection, known as paresis or general paralysis, with artificially inoculated malarial fever. A study of these reports shows that about 25 per cent. of patients have been practically cured. Before the malaria treatment only one or two per cent. of the victims had complete remissions and patients died within three or four years.

The U. S. Public Health Service is cooperating with the State Hospital at Columbia, S. C., in its new investigation. The malarial parasites rapidly die if blood in which they are located is removed from the human body. The growth of the fever-producing organisms in cultures will be studied.

The curative fever can be transmitted by the bite of an infected Anopheles mosquito and the Public Health Service scientists will study the transportation of mosquitoes and their part in this new method of restoring sanity.

Science News Letter, May 21, 1932

PHYSIOLOGY

Early Treatment for Excessive Weight Advised

THE PROPER time to treat excessive weight is in the early stages, when the patient is just beginning to put on weight, Dr. E. Kost Shelton of Santa Barbara, Calif., declared before the meeting of the Association for the Study of Internal Secretions. He reported favorable results with the new Willoughby method of determining a person's ideal weight. Measurements of girth at shoulder, hip and thigh levels and around wrists, knees and ankles are taken and the ideal weight computed from these. This takes into account the size of the bones, and is adapted to all persons of the white race regardless of age or body build, he said.

Science News Letter, May 21, 1932

GEOLOGY

How Heavy Is a Mountain?

"A Classic of Science"

**Pratt the Eminent Geodesist and Airy the Astronomer
Discuss the Density and Thickness of Earth's Crust**

Airy

ON THE COMPUTATION OF THE EFFECT OF THE ATTRACTION OF MOUNTAIN MASSES, as disturbing the Apparent Astronomical Latitude of Stations in Geodetic Surveys. By G. B. Airy, Esq., Astronomer Royal In *Philosophical Transactions of the Royal Society of London*. Vol. 145. London MDCCCLV (1855).

A PAPER of great ability has lately been communicated to the Royal Society by Archdeacon Pratt, in which the disturbing effects of the mass of high land northeast of the valley of the Ganges, upon the apparent astronomical latitudes of the principal stations of the Indian Arc of Meridian, are investigated. It is not my intention here to comment upon the mathematical methods used by the author of that paper, or upon the physical measures on which the numerical calculation of his formulae is based, but only to call attention to the principal result; namely, that the attraction of the mountain-ground, thus computed on the theory of gravitation, is considerably greater than is necessary to explain the anomalies observed. This singular conclusion, I confess, at first surprised me very much.

Nothing Surprising . . .

Yet, upon considering the theory of the earth's figure as affected by disturbing causes, with the aid of the best physical hypothesis (imperfect as it must be) which I am able to apply to it, it appears to me, not only that there is nothing surprising in Archdeacon Pratt's conclusion, but that it ought to have been anticipated; and that, instead of expecting a positive effect of attraction of a large mountain mass upon a station at a considerable distance from it, we ought to be prepared to expect no effect whatever, or in some cases even a small negative effect. The reasoning upon which this opinion is founded, inasmuch as it must have some application to almost every investigation

of geodesy, may perhaps merit the attention of the Royal Society.

Although the surface of the earth consists everywhere of a hard crust, with only enough of water lying upon it to give us everywhere a *couche de niveau*, and to enable us to estimate the heights of the mountains in some places, and the depths of the basins in others; yet the smallness of those elevations and depths, the correctness with which the hard part of the earth has assumed the spheroidal form, and the absence of any particular preponderance either of land or of water at the equator as compared with the poles, have induced most physicists to suppose, either that the interior of the earth is now fluid, or that it was fluid when the mountains took their present forms. This fluidity may be very imperfect; it may be mere viscosity; it may even be little more than that degree of yielding which (as is well known to miners) shows itself by changes in the floors of subterranean chambers at a great depth when their width exceeds 20 or 30 feet; and this yielding may be sufficient for my present explanation. However, in order to present my ideas in the clearest form, I will suppose the interior to be perfectly fluid.

In the accompanying diagram, fig. 1, suppose the outer circle, as far as it is complete, to represent the spheroidal surface of the earth, conceived to be free from basins or mountains except in one place; and suppose the prominence in the upper part to represent a table-land, 100 miles broad in its smaller horizontal dimension, and two miles high. And suppose the inner circle to represent the concentric spheroidal inner surface of the earth's crust, that inner spheroid being filled with a fluid of greater density than the crust, which, to avoid circumlocution, I will call *lava*. To fix our ideas, suppose the thickness of the crust to be ten miles through the greater part of the circumference, and therefore twelve miles at the place of the table-land.

Now I say, that this state of things is

impossible; the weight of the table-land would break the crust through its whole depth from the top of the table-land to the surface of the lava, and either the whole or only the middle part would sink into the lava. . . .

If instead of supposing the crust ten miles thick, we had supposed it 100 miles thick, the necessary value for cohesion would have been reduced to 1/5th of a mile nearly. This small value would have been as fatal to the supposition as the other. Every rock has mechanical clefts through it, or has mineralogical veins less closely connected with it than its particles are among themselves; and these render the cohesion of the firmest rock, when considered in reference to large masses, absolutely insignificant. The miners in Cornwall know well the danger of a "fall" of the firmest granite or killas where it is undercut by working a lode at an inclination of 30° or 40° to the vertical.

Supported from Below . . .

We must therefore give up the supposition that the state of things below a table-land of any great magnitude can be represented by such a diagram as fig. 1. And we may now inquire what the state of things really must be.

The impossibility of the existence of the state represented in fig. 1 has arisen from the want of a sufficient support of the table-land from below. Yet the table-land does exist in its elevation, and therefore it *is* supported from below. What can the nature of its support be?

I conceive that there can be no other support than that arising from the downward projection of a portion of the earth's light crust into the dense lava; the horizontal extent of that projection corresponding rudely with the horizontal extent of the table-land, and

What happens when a liquid turns into a gas? Andrews describes the

CRITICAL PHASE

in the next

CLASSIC OF SCIENCE

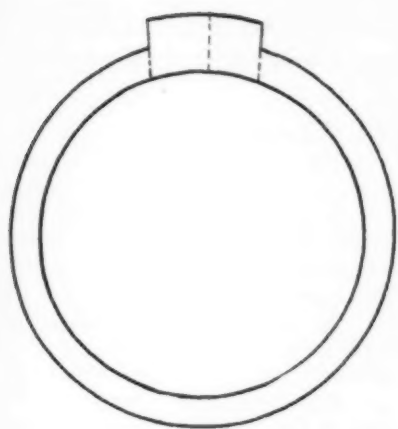


Fig. 1

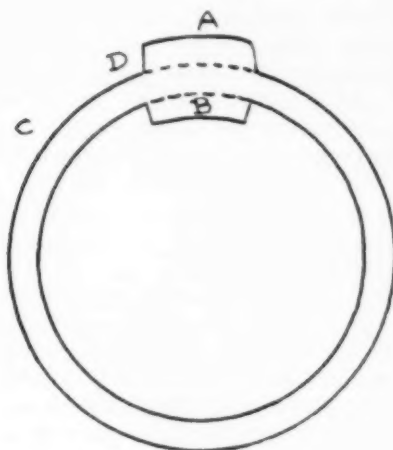


Fig. 2

MOUNTAINS AND THE EARTH'S CRUST

Airy used diagrams like these to illustrate his idea that mountains are not extra loads on the crust of the earth, but masses floating on the more or less fluid material of its core. Pratt modified this theory to make the crust much thicker, and believed that there is a deficiency of matter below mountains and an excess below the oceans, so that the amount of matter in every part of the crust is the same. Pratt's theory is the basis of the modern science of isostasy.

the depth of its projection downwards being such that the increased power of flotation thus gained is roughly equal to the increase of weight above from the prominence of the table-land. It appears to me that the state of the earth's crust lying upon the lava may be compared with perfect correctness to the state of a raft of timber floating upon water; in which, if we remark one log whose upper surface floats much higher than the upper surfaces of the others we are certain that its lower surface lies deeper in the water than the lower surfaces of the others.

This state of things then will be represented by fig. 2. Adopting this as the true representation of the arrangement of masses beneath a table-land, let us consider what will be its effect in disturbing the direction of gravity at different points in its proximity. It will be remarked that the disturbance depends on two actions; the positive attraction produced by the elevated table-land; and the diminution of attraction, or negative attraction, produced by the substitution of a certain volume of light crust (in the lower projection) for heavy lava.

The diminution of attractive matter below, produced by the substitution of light crust for heavy lava, will be sensibly equal to the increase of attractive matter above. The difference of the negative attraction of one and the positive attraction of the other, as estimated in the direction of a line perpendicular to that joining the centres of attraction

of the two masses (or as estimated in a horizontal line), will be proportional to the difference of the inverse cubes of the distances of the attracted point from the two masses. . . .

Pratt

ON THE DEFLECTION OF THE PLUMB-LINE IN INDIA, caused by the Attraction of the Himalaya Mountains and of the elevated regions beyond; and its modification by the compensating effect of a Deficiency of Matter below the Mountain Mass. By the Venerable John Henry Pratt, M.A., Archdeacon of Calcutta. In *Philosophical Transactions of the Royal Society of London*. Vol. 149. London: MDCCCLX (1860).

THE Astronomer Royal, in a paper published in the Transactions for 1855, suggested that immediately beneath the mountain-mass there was most probably a deficiency of matter, which would produce, as it were, a negative attraction, and so counteract the effect on the plumb-line. This hypothesis appears, however, to be untenable for three reasons: (1) It supposes the thickness of the earth's solid crust to be considerably smaller than that assigned by the only satisfactory physical calculations made on the subject—those by Mr. Hopkins of Cambridge. He considers the thickness to be about 800 or 1000 miles at least. (2) It assumes that this thin crust is lighter than

the fluid on which it is supposed to rest. But we should expect that in becoming solid from the fluid state, it would contract by loss of heat and become heavier. (3) The same reasoning by which Mr. Airy makes it appear that every protuberance outside this thin crust must be accompanied by a protuberance inside, down into the fluid mass, would equally prove that wherever there was a hollow, as in deep seas, in the outward surface, there must be one also in the inner surface of the crust corresponding to it; thus leading to a law of varying thickness which no process of cooling could have produced.

It is nevertheless to this source—I mean a Deficiency of Matter below—that we must look, I feel fully assured, for a compensating cause, if any is to be found. My present object is to propose another hypothesis regarding deficiency of matter below the mountain-mass, as first suggested by Mr. Airy; and to reduce my hypothesis to the test of calculation. . . .

I will now state the hypothesis on which my present calculation proceeds. At the time when the earth had just ceased to be wholly fluid, the form must have been a perfect spheroid, with no mountains and valleys nor ocean-hollows. As the crust formed, and grew continually thicker, contractions and expansions may have taken place in any of its parts, so as to depress and elevate the corresponding portions of the surface. If these changes took place chiefly in a vertical direction, then at any epoch a vertical line drawn down to a sufficient depth from any place in the surface will pass through a mass of matter

▼ The Science Service radio address next week will be on the subject of

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FLYING THROUGH THE ANCIENT NEAR EAST

Dr. Charles Breasted

of The Oriental Institute, University of Chicago, will speak, vividly summarizing his flight from Egypt across Palestine and Persia

FRIDAY, MAY 27

at 2:45 P. M., Eastern Standard Time

Over Stations of

The Columbia Broadcasting System

which has remained the same in amount all through these changes. By the process of expansion the mountains have been forced up, and the mass thus raised above the level has produced a corresponding *attenuation* of matter below. This attenuation is most likely very trifling, as it probably exists through a great depth. Whether this cause will produce a sufficient amount of compensation can be determined only by submitting it to calculation, which I proceed to do. . . .

ON THE CONSTITUTION OF THE SOLID CRUST OF THE EARTH. By Archdeacon Pratt. In *Philosophical Transactions of the Royal Society of London*. Vol. 161. London: MDCCCLXXI (1871).

A FEW years ago I proposed the following hypothesis regarding the Constitution of the Earth's Solid Crust, viz.:—that the variety we see in the elevation and depression of the earth's surface, in mountains and plains and ocean-beds, has arisen from the mass having contracted unequally in becoming solid from a fluid or semifluid condition: and that below the sea-level under mountains and plains there is a deficiency of matter, approximately equal in amount to the mass above the sea-level; and that below ocean-beds there is an excess of matter, approxi-

mately equal to the deficiency in the ocean when compared with rock; so that the amount of matter in any vertical column drawn from the surface to a level surface below the crust is now, and ever has been, approximately the same in every part of the earth.

The process by which I arrived at this hypothesis I will explain. In the *Philosophical Transactions* for 1855 and 1858 I showed that the Himalayas and the Ocean must have a considerable influence in producing deflection of the plumb-line in India. But by a calculation of the mean figure of the earth, taking into account the effect of local attraction, it appeared that nowhere on the Indian Arc of meridian through Cape Comorin is the resultant local attraction, arising from all causes, of great importance. This result at once indicated that in the crust below there must be such variations of density as nearly to compensate for the large effects which would have resulted from the attraction of the mountains on the north of India and the vast ocean on the south, if they were the sole causes of disturbance,—and that, as this near compensation takes place all down the arc, nearly 1500 miles in length, the simplest hypothesis is, that beneath the mountains and plains there is a deficiency of matter nearly equal to the deficiency in the ocean itself. . . .

Science News Letter, May 21, 1932

MEDICINE

Yellow Fever Susceptibility Determined by New Test

A TEST for determining the success of the new vaccine against yellow fever, dread plague which claimed five victims out of every hundred persons in New Orleans fifty-eight years ago, was discussed at the meeting of the American Medical Association there.

Drs. T. P. Hughes and W. A. Sawyer of the Rockefeller Foundation, New York City, who just announced that they were able to give lasting protection against yellow fever by a newly-developed method that makes use of mouse serum, described the test.

In this test the germ or virus of yellow fever is mixed with the blood serum of the person being tested and injected into mice. If the person has in his blood

protective substances that guard against yellow fever, they will neutralize the yellow fever virus and the mice stay well. If the mice get the disease it proves that the person's blood lacks the protective substances and hence that he is susceptible to the disease.

The specific nature of this test was proved by trying it on Canadians, who have never been exposed to yellow fever. As was expected, it showed that they did not have the protective substances.

Science News Letter, May 21, 1932

Platinum melts at a temperature of 3200 degrees Fahrenheit, a heat some 500 degrees higher than is needed to melt steel.

PHYSIOLOGY

Reactions of Normal Eyes Timed with Movie Camera

MEASUREMENTS with the motion picture camera of the time it takes the pupils of normal eyes to contract and to dilate were reported by Dr. Harry S. Gradle of Chicago, at the meeting of the American Medical Association. He found that when light is flashed on a normal eye accommodated for the dark, there is a latent period of about one-tenth of a second before the pupil starts to contract. Then, in a little over four-tenths of a second, the pupil jumps to its maximum contraction. When the light is removed, the pupil starts to dilate at a uniform rate. In making his studies, Dr. Gradle was obliged to use young, blue-eyed, blond persons, because the dark irises of brunets did not photograph clearly enough.

Science News Letter, May 21, 1932

ENGINEERING

Iodine From Oil Brines Breaks Former Monopoly

LARGE scale production of iodine from salty brines in California and Louisiana has freed America from a South American monopoly of this essential chemical element.

This was revealed at a review of recent chemical progress arranged by the American Institute.

For years this comparatively rare chemical element has been controlled by interests in Chile that restricted the amount sold and charged a high toll. Several years ago Los Angeles petroleum engineers analyzing brackish waters from oil wells near Long Beach, Calif., discovered iodides in paying quantities. Difficulty was experienced in freeing the iodine from the large amount of worthless salts with which it was associated, but processes were perfected that resulted in commercial production of the element from both Californian oil well brines and a salt-water well in Louisiana. This assures the continuance of the supply of iodine necessary for drug, disinfectant, photographic and other uses even during a possible wartime blockade. It may reduce the price of iodine so materially as to allow new uses.

The successful production of milk of magnesia from sea water in California was also reported by S. D. Kirkpatrick, editor of *Chemical and Metallurgical*

Engineering, who coordinated the summaries of new chemical achievements.

How wood can be protected and given metal coats by impregnating it with alloys of light-weight metals, such as lead, zinc, tin and antimony, has been perfected in Germany, the meeting was told.

Synthetic rubber, felt-coated steel, pyrex glass bricks and so-called plastic metals made of metal powders bound together with a cellulose compound were also exhibited.

Science News Letter, May 21, 1932

ARCHAEOLOGY

Modern Indians Surpassed By Monte Alban Jewelers

THE PREHISTORIC Indians who fashioned the now famous Monte Alban jewels were finer craftsmen than can be found today among all the Indian jewelers of Mexico.

This is the tribute paid by Indian jewelers from the State of Guerrero who have examined the beautiful ornaments found last January in the treasure tomb of Monte Alban, Mexico.

The gold articles which the jewelers examined were pronounced over eighteen carat pure. What appears to be delicate filigree in some of the golden ornaments, experts recognized as not filigree at all. The articles were actually poured in molds very finely and skillfully carved. Other pieces were wrought in a hammered process, they said.

Science News Letter, May 21, 1932

BIOCHEMISTRY

Synthetic Hormones May Be Too Pure to Be Effective

BIOCHEMISTS are producing hormones that are too pure, Dr. Joseph C. Aub of Boston suggested before the meeting of the Association for the Study of Internal Secretions. These highly purified extracts do not produce the practical results on patients that earlier, impure extracts did, he pointed out. He suggested that in the process of getting pure crystals of a hormone, the chemist may have broken down the natural compound and gotten a "degradation product" lacking some essential of the original one produced by the gland in the body. He also warned the physicians against laying too much stress on glandular treatment alone and said there was no excuse for treatment with several glandular products at once.

Science News Letter, May 21, 1932

GENETICS

Genes, Once Hypothetical, Now Seen and Photographed

GENES, the ultimate units in heredity, have been seen and photographed. So declares Dr. John Belling, biologist on the staff of the Carnegie Institution of Washington.

Genes have hitherto been dealt with as hypothetical entities by biologists, because no one has ever actually seen them. They were like the atoms and electrons that make up matter: physicists treat them as actually existing things, though it is impossible to give them visual demonstration. But now Dr. Belling believes that he has brought the genes out of their invisibility.

All living cells contain structures that presumably contain genes—the chromosomes within the nucleus. But to get clear-cut pictures of chromosomes not all cells will do equally well. In the cells of some organisms chromosomes are too numerous or too small to work with conveniently; in others their outlines are not clear-cut.

Dr. Belling found lilies suitable for his purpose. By exceedingly fine and skillful microscopic technique, he got the contents of the pollen "mother-cells," each only one four-hundredth of an inch in diameter, emptied out on glass slides. By suitable chemical treatment he made the small divisions of the chromosomes, known as chromomeres, sharply visible. By further manipulation he was able to detect, within each chromomere, an exceedingly minute object which he takes to be the gene itself. A typical cell of the type Dr. Belling has been working with contains about 4400 genes, arranged in 2200 pairs.

The picture on the cover of this week's SCIENCE NEWS LETTER shows chromomere strings in a single cell of a lily.

In commenting upon the function of cell structures, Dr. Belling says:

"A minute cell sphere with its 2200 gene pairs suggests the celestial sphere visible to the unaided eye and containing fewer than 3000 stars which can be seen at one time. These stars were supposed by some to exert a mystic influence on human beings. In the spherical cells of the organism, however, the genes actually do exert specific influences on the life of the organism in question,

See Front Cover

whether of the lily or of man. In fact these influences are so great that if the effects of all the thousands of genes in a given organism were added together nearly the whole of its inheritance would be accounted for.

"These strings of chromomeres are of more consequence, therefore, than the threads of life which, according to the old fable, the Fates were supposed to spin. Indeed, in many of the old sayings relating to the influences of the stars, if the term gene or chromomere be substituted for star the saying would hold today. Could we but identify every one of the chromomeres in a man, (probably there are many more than in a lily), a reliable horoscope for him could be drawn up."

Science News Letter, May 21, 1932

PLANT PHYSIOLOGY

Secret of Photosynthesis Baffling to Scientists

SCIENCE has not yet solved the green leaf's secret of storing up the energy of sunlight by converting carbon dioxide into carbohydrates, it appears from research by Prof. G. Mackinney of the University of California's division of plant nutrition.

Vegetation has the ability of turning carbon dioxide, the gas exhaled by organisms and given off by fire, into carbohydrates, useful as starches, sugars and cellulose. Some six years ago Prof. E. C. C. Baly, professor of chemistry, University of Liverpool, reported the reduction of carbon dioxide to formaldehyde and carbohydrates in vitro, that is, in the test tube. Others worked on the same important problem with varying success. Prof. Mackinney has attempted to repeat the experiments but has been forced to conclude in his report to the American Chemical Society that "no procedure has yet been published whereby conditions for obtaining formaldehyde and carbohydrates in vitro can be duplicated."

Photosynthesis, as this process is called, is fundamental to the existence of life on earth through the utilization of sun energy.

Science News Letter, May 21, 1932

ASTRONOMY

New Heavenly Neighbor Passes Within Orbit of the Earth

Reinmuth Object, With Diameter of Three Miles, Regarded As One of Most Remarkable Bodies in the Solar System

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COMPUTATIONS at Harvard Observatory of the orbit of the object recently discovered by Dr. Karl Reinmuth at Heidelberg, Germany, indicate that this is one of the most remarkable and important minor bodies in the solar system. Its period around the sun is two years, which is shorter than that of any known comet, the next shortest being Encke's comet with a period of three and a third years.

The object is remarkably near the earth, about eight million miles away, and has passed within the earth's orbit. Since its discovery on April 27, the object has been observed at Heidelberg, Harvard and the Yerkes Observatories.

The object appears to have a sharp nucleus and may be intermediate between asteroids and comets. The Harvard computations were made by Dr. F. L. Whipple and L. E. Cunningham.

Reinmuth's object, new neighbor of the earth, passed inside the earth's orbit on May 16 at a distance of approximately eight million miles from the earth, Dr. Fred L. Whipple and L. E. Cunningham of the Harvard College Observatory determined.

Minute Speck in Heavens

The minute speck in the heavens has a diameter of about three miles. It is twelfth magnitude and will not become visible to the unaided eye. It is moving half as fast as the moon across the sky.

If the Reinmuth object is an asteroid, it will be the first to come within the earth's orbit. Computations also indicate that it will pass within the orbit of Venus, the planet next closest to the sun. Its orbit about the sun is shaped like the inside of a hat.

For the moment, astronomers will refer to this heavenly body as the Reinmuth object, but if it is judged an asteroid or minor planet, Dr. Karl Reinmuth, who discovered it, will have the privilege of naming it. If it proves

to be a comet, it will be called the Reinmuth comet of 1932.

The Reinmuth object is an asteroid and not a comet in the opinion of Prof. George Van Biesbroeck, of Yerkes Observatory, who has observed it. It is one of the most important heavenly bodies discovered in recent years. Not since the discovery of the ninth planet, Pluto, have astronomers been so interested.

The Reinmuth object will come six million miles closer to the earth than the famous asteroid, Eros, discovered in 1898, which until a few weeks ago was known as the object that approached the earth closer than any other regular

ASTRONOMY

Reinmuth's "Comet" Shown To Be New Minor Planet

REINMUTH'S "comet," discovered on December 31 of last year by Dr. K. Reinmuth of the Badische Landes-Sternwarte at Heidelberg, has really proven to be a new minor planet, according to calculations announced by the Astronomisches Recheninstitut, Berlin, which keeps track of discoveries of these tiny planets, or asteroids. Though nearly 1,500 are known, the new one is of particular interest because it becomes the tenth known member of the famous "Trojan" group. These are of great importance because they all move in the plane of the orbit of the planet Jupiter, and remain at approximately the same distance from Jupiter and from the sun as Jupiter itself is from the sun, about 483 million miles. Thus, the asteroid, Jupiter and the sun remain continually at the corners of an equilateral triangle.

Such motion represents a solution of the three-body problem. Though mathematicians can calculate the motion in space of two bodies which have an attraction on each other, no one has yet

member of the solar system except the moon.

By a coincidence, it was found just a few days ago that the Delporte object, discovered the middle of March in Belgium, comes closer to earth than Eros but the Reinmuth object's distance of eight million miles now breaks the Delporte object's record of ten million miles.

Planet Spoiled in Making

The asteroids are minor planets, most of which rotate about the sun in the wide gap of the solar system between Mars and Jupiter. More than a thousand asteroids have been discovered in that region and one theory is that they represent the remnants of a single planet that was spoiled in the making.

This Reinmuth object discovered by Dr. Karl Reinmuth on April 27 should not be confused with the "Reinmuth object" discovered by the same German astronomer last year and found to be a new member of the famous Trojan group of asteroids.

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succeeded in fully solving the problem for three bodies. The famous German mathematician, J. L. Lagrange, showed how it could be solved for three bodies moving at the vertices of an equilateral triangle, and the Trojan asteroids proved to be actual examples of this solution. All are small bodies, less than a hundred miles in diameter, and so distant from the earth that they can only be detected with the largest telescopes. The group is so called because they are all named after figures from Greek mythology associated with the Trojan wars. These are Achilles, the first to be discovered, Hector, Nestor, Agamemnon, Odysseus, all of which move ahead of Jupiter, and Patroclus, Priamus, Aeneas, Anchises and the new one, which follow Jupiter. So far, a name has not been assigned to the new discovery and it is designated only by a number, 1931YA. According to precedent, Herr Reinmuth has the privilege of giving it a name.

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Hawk-Moth

IF YOU HAVE a bed of larkspur, or a trumpet-creper vine, or any of the other flowers beloved by humming-birds, you will often see, especially at dusk, numbers of big moths that at first you might mistake for humming-birds. They are almost as large in the body, they hover before the flowers with an invisible whirl of wings, they dart to a new position with the bulletlike flight of their tiny feathered prototypes.

But they are creatures far removed from birds—less like humming-birds in fundamental structure than they are like lobsters, even though their flight habits and food preferences may suggest kinship to these flying feathered jewels from the tropics. They are hawk-moths, among the largest and most highly evolved of moths, and also the swiftest and most expert in flight of these nocturnal insects.

If you are fortunate enough to find one of these living arrows at rest for a moment on a leaf, you will be struck by the resemblance between its general outline and that of a modern racing airplane. Its body is rather stout, it is true, like that of most moths; but it is tapered and streamlined and proportioned very much like the fuselage of an airplane. Its wings, instead of being great expanses such as those displayed by a Luna moth, adapted for flapping or fluttering, are trimmed down to a severe, athletic leanness, and shaped as an aviation engineer would like to shape the wings of his craft. The after pair of wings, much shortened and narrowed, have become virtually merely auxiliaries of the front pair: our moth is in effect a monoplane.

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PLANT PATHOLOGY

Heavy Tax on Farm Products Levied by Plant Diseases

TAXES on farm products, heavier than any legislative body would ever dare to levy, are assessed every year by plant diseases caused by fungi, bacteria and other parasitic microbes. This is made strikingly evident by a summary just issued by the U. S. Department of Agriculture, covering plant disease damage to the principal agricultural and horticultural crops for the years 1928, 1929 and 1930, the latest dates for which approximately complete figures are available.

Corn, the most important single crop in America, in 1928 had to give up 10.3 per cent. of its 2,839,959,000-bushel crop to its principal diseases. In 1929 the crop and the "tax" were both smaller: 2,622,189,000 bushels, with an 8.5 per cent. loss. Another drop occurred in 1930: crop 2,081,048,000; plant disease loss 7.6 per cent.

Cotton stands next to corn in economic importance in this country. The 1928 crop of 14,373,000 bales was cut 2,432,000 bales, or 17.2 per cent., by the worst of the cotton diseases. In 1929 a crop of nearly 15,000,000 bales suffered a 14 per cent. loss. In 1930 the crop was only a little smaller than that of 1928, but its damage was considerably less—just short of 10 per cent.

Wheat, the third big-money crop when prices are normal, was taxed by its main fungus enemies to the extent

of 7.8, 8.2 and 5.7 per cent., respectively, of its total yields during the period, which ran between eight and nine hundred millions of bushels.

Some regional losses naturally ran higher than the average for the country at large. This was not of country-wide importance in some instances; but when the great wheat state of Kansas lost by disease 9.75 per cent. of its 1930 wheat crop, while the national average was only 5.7 per cent., it was a matter of more than local concern.

The general average disease loss for the country as a whole, in the crops reported, ranged around the five to ten per cent. bracket. Thus, the 1930 loss in barley was 4.2 per cent.; in oats, 3.7 per cent.; in pears, 13.9 per cent.; in apples, 11.5 per cent.; in peaches, 4.5 per cent. Potatoes, however, seem to have more virulent enemies; their nation-wide loss in 1930 was 22.4 per cent.

The figures as given in this report are for plant diseases only; losses due to the inroads of insect enemies are not considered, since they are the concern of a different bureau of the Department of Agriculture. There are literally thousands of plant diseases, since every cultivated and wild plant has plant parasitic enemies ranging in numbers from single species to scores.

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Marine Biology

NONSUCH: LAND OF WATER—William Beebe—*Brewer, Warren and Putnam*, 259 p., \$3.50. Will Beebe seems to be happiest when he is thoroughly wet, achieving as close an amphibious kinship with the creatures of the sea as is given to a land-living, air-breathing vertebrate. In this new book he captures the reader, as he usually succeeds in doing, and takes him into the tide-pools and lagoons with him, to see the interesting and charming creatures that are at home in Bermudan waters.

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Anthropology

PLAINS INDIAN PARFLECHE DESIGNS—Leslie Spier—*Univ. of Washington Press*, 25 p., 35c. Drawings of 167 Indian designs on parfleche—envelopes made of folded rawhide. The illustrations now published are a supplement to "An Analysis of Plains Indian Parfleche Decoration," which appeared in 1925, as one of the University of Washington Publications in Anthropology.

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Ornithology

HOW TO SEE BIRDS—E. F. Daglish—*Morrow*, 128 p., \$1.50. A conveniently pocket-sized book, with illustrations in black and white. It does not undertake to identify the birds, but rather gives suggestions on how to seek them and how to get them to come to you.

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Evolution

EVOLUTION AND THEOLOGY—Ernest C. Messenger—*Macmillan*. 313 p., \$2.50. The Catholic Church has never taken an "official" position on the subject of evolution as such, and there is no indication that it is likely to do so. Individual Catholic opinion ranges from the definitely evolutionary position of such men as Dorlodot and Wassmann to the extreme anti-evolutionism of McCann. The present author, an evolutionist, examines the problem strictly from the theological point of view, and finds much support among the Fathers, notably St. Ephrem, St. Gregory of Nyssa and St. Basil in the East, as well as St. Augustine in the West. Within the Church, the book, bearing as it does full permission of ecclesiastical authorities, is bound to have much effect through the use which may be anticipated for it as a text and reference volume in the seminaries. Among secular

scientists, it will be exceedingly useful for its full quotations and intelligent comment on early evolutionary speculations which are of necessity treated somewhat sketchily in such works as Osborn's "From the Greeks to Darwin".

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Biology—Philosophy

LIFE IN NATURE—James Hinton—*Dial Press*. 291 p., \$3. A vigorous nineteenth century thinker's essay on the nature and meaning of life, resurrected, edited and given a foreword by Havelock Ellis. Hinton's views were doubtless somewhat shocking in their day; now they appear rather conventional—the times have caught up with him.

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Astrophysics

ANNALS OF THE ASTROPHYSICAL OBSERVATORY OF THE SMITHSONIAN INSTITUTION, VOL. V—C. G. Abbot, L. B. Aldrich and F. E. Fowle—*Smithsonian Institution*, 295 p., 11 pl. The present volume sums up the progress of a decade in the Smithsonian Institution's very important study of the physical behavior of the sun, describes new instruments and improvements in old ones, and gives extensive tables of data.

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Botany

REPORT OF PROCEEDINGS, FIFTH INTERNATIONAL BOTANICAL CONGRESS—Edited by F. T. Brooks and T. F. Chipp—*Cambridge University Press*. 680 p., \$7. This book makes a permanent record of the proceedings of the Fifth International Botanical Congress held at Cambridge, England, in 1930. To American botanists who attended, and even more to those who stayed at home, its appearance will be most welcome. It is a monument to the two Secretaries of the Congress whose unstinted labor made it possible.

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Bibliography

BOOKLIST BOOKS, 1931—*American Library Association*. 58 p. 65c. A list of the best books of the past year, arranged conveniently by subject.

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Horticulture

PLANNING AND PLANTING THE HOME GARDEN—Pauline Murray—*Orange Judd*, 412 p., \$3.50. Anyone in search of a single book that will tell how to accomplish the successful marriage of a house to a lot to make a home will not need to look further than this volume. It lays the principal stress where the stress should be laid, on planning the garden; it gives good little sketches of lay-outs and garden accessories; it is lavish with its illustrations of successful home gardens.

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Archaeology

THE ARCHAEOLOGY OF PALESTINE AND THE BIBLE—William Foxwell Albright—*Revell*, 233 p., \$2. The Richards Foundation Lectures given by Dr. Albright at the University of Virginia are the basis of this volume. The book is, therefore, a "college course," not of the comprehensive, cramming type, but a general cultural course. Dr. Albright devotes considerable space to the unearthing of a single Biblical city, the old Kirjath Sepher, where he himself has worked for a number of seasons. This site with its many layers of occupation gives the reader a particularly good idea of how the archaeologist unearths Bible history and the sort of evidence he finds.

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Agriculture

BALLIÈRE'S ENCYCLOPAEDIA OF SCIENTIFIC AGRICULTURE—Edited by Herbert Hunter—*Ballière, Tindall and Cox (London)*. 1362 p. (in 2 vols), \$13. Prepared by a large group of specialists under the editorship of one of the foremost of English agricultural scientists, this new encyclopedic treatment of agriculture as it is practised in the British Isles will be highly valuable in American libraries as a reference book for purposes of comparison with methods and problems on this side of the ocean. Furthermore, many of the articles are not subject to the limitations of geographic location, but are valid for any part of the world. It is a work that must certainly find its way to the library shelves of all agricultural colleges.

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